DOCUMENT RESUME

ED 236 248 TM 830 778

AUTHOR Anderson, Beverly L.; Ward, Barbara J.

TITLE Student Achievement in America: State Policy Implications for a High Technology Economy.

INSTITUTION Education Commission of the States, Denver, Colo. National Assessment of Educational Progress.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
REPORT NO NAEP-AY-HT-35
PUB DATE Aug 83
GRANT NIE-G-80-0003
NOTE 29p.
AVAILABLE FROM National Assessment of Educational Progress, Box 2923, Princeton, NJ 08541.
PUB TYPE Viewpoints (120) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Basic Skills; Educational Assessment; *Educational Needs; Elementary Secondary Education; *Futures (of Society); Minimum Competencies; National Programs; *Public Policy; *Technological Advancement
IDENTIFIERS High Technology; *National Assessment of Educational Progress

ABSTRACT

Three aspects of the match between education and the demands of our changing economic situation are examined. First, the skills students will need for the future are identified. These skills included competencies in reading, writing, speaking and listening, mathematics, science, reasoning, basic employment, economics, and computer literacy. Second, current levels of achievement with respect to these skills are explored. The data are drawn from the results of the National Assessment of Educational Progres (NAEP) in reading, mathematics, science, writing, literature, and consumer competencies. The overall NAEP findings were not particularly encouraging, especially for 17-year-olds. This paper concludes by making suggestions for correcting this mismatch between current achievement levels and necessary skills. It is recommended that educators first examine the lists of skills needed, determine which are appropriate for individual states or communities, and sort through those skills with business and industry leaders and parents. Then these groups should act in concert to remedy the problems they face. Primary type of information provided by report: Procedures (Analysis). (BW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

AY-HT-35

ED236248

Student Achievement in America: State Policy Implications for a High Technology Economy

Beverly L. Anderson and Barbara J. Ward

August 1983

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

The recent report of the National Commission on Excellence in Education informed Americans in no uncertain terms that "our nation is at risk" because we are committing "unthinking, unilateral, educational disarmament." As a consequence, the report went on to warn, we face a "rising tide of mediocrity that threatens our very future as a nation and as a people." Shortly thereafter, the Education Commission of the States' Task Force on Education for Economic Growth painted an equally bleak picture of our country's educational system, particularly in terms of its ability to prepare our young people to enter the economy of the future. Further reinforcing these gloomy assessments, a study conducted by the Center for Public Resources states emphatically that too many young people sorely lack the basic skills needed for employment.

These are only a few of the recent reports, articles and other calls to arms focusing attention on the educational problems we face as we cope with our changing economy. Our evolving high technology society is demanding a reevalution of the skills needed by our students and a careful examination of where we stand in helping our students acquire those skills.

We will examine three aspects of the match--or more accurately, the mismatch--between education and the demands of our changing economic situation. First, we'll consider the skills students will need for the future; second, current levels of achievement with respect to these skills; and third, what can be done to correct the mismatch we have found.

What Skills Will Be Needed?

As we try to identify the kinds of "basic" skills that are needed in today's high tech economy, there are several cautions we need to keep in mind.

1. Although we are in a high tech economy, high tech jobs will not necessarily be the fastest growing in the coming decade. A survey by the School of Education at Stanford University shows that between 1978 and 1990 the 10 fastest growing occupations will be:

   data processing machine mechanics
   paralegals
   computer systems analysts
   office machine operators
   cash register servicers
   janitors
   computer operators

TM830778

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
T. Pratt
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

nurses aides and orderlies
sales clerks
cashiers
waiters and waitresses

2. Furthermore, the immediate crisis in terms of our nation's economic growth must not blind us to the need for students educated for more than high tech skills--for students with an understanding and appreciation of the arts and other areas of the traditional liberal education. Even though these may not be directly linked to economic payoffs, they are closely tied to our quality of life.

3. We need to prepare students not only to enter the work force, but also to move beyond entry-level positions. Enabling workers to move within the work force will cut down on job frustration and high turnover rates.

The report of the Center for Public Resources, titled "Basic Skills in the U. S. Work Force," points out that a strong national economy for the 1980s will demand expanded industrial productivity, a productivity that will depend, in large part, on an adequately skilled work force. Yet, the statistics on educational preparedness are grim. Among 17-year-olds, 13 percent of whites, 43 percent of blacks and 56 percent of Hispanics are functionally illiterate. Between 40 and 50 percent of all students living in urban areas have serious reading difficulties.

Educators and public policy makers have lavished considerable attention on the educational aspects of the problem, focusing on questions of educational methodology and curriculum development. But seldom have policy makers attempted to understand business perspectives in analyzing problems of the secondary schools, the study notes. Yet, as a potential and actual employer of secondary school graduates and nongraduates, it is perhaps American business that best understands the need to tackle basic skills deficiencies.

Let's consider findings from two studies that address the kinds of basic skills needed. Looking first at the study from the Center for Public Resources, which surveyed companies' and union leaders' assessments of the basic skill levels of the work force, we find that there are significant differences in business' and educators' perceptions of needs. Among these:

- <u>A gap exists between business and school system perceptions of basic skills "adequacy."</u>

  The majority of surveyed companies identified employee problems with basic skills in many job categories. But over 75 percent of the school systems assessed the majority of their graduates as "adequately prepared" for employment.

- Businesses and unions identified speaking/listening, mathematics and science skills as those most frequently deficient.

  Educators, on the other hand, were most likely to cite reading skills as the biggest problem area.

- Even in less advanced job categories, both businesses and unions identified widespread deficiencies in mathematics and science.

  It appears that the basics of the physical sciences are increasing in importance as technology begins to affect virtually every factory and office job. However, one-fourth of the responding school officials listed science as "of little importance."

- Two-thirds of the companies and most unions noted that basic skills deficiencies limit the job advancement of employees.

  In hiring a new employee, a business thinks of a long-term investment in an individual. School systems seem to educate only for the "first job," rather than for the longer viability of the individual in the working world.[1]

A second study of importance in determining basic skills for the 1980s and beyond is the College Board's Educational Equity Project. During 1980 and 1981, over 400 teachers and administrators from secondary schools and colleges hammered out a statement on the academic preparation needed for college in the 1980s. Although this statement was geared toward college preparation rather than skills needed for employment, it complements the Center for Public Resources study to create a fair picture of skills that business, industry and educators see as critical for secondary students in the future.

A combination of skills drawn from these two sources forms the basis of the list of "basic" skills needed for the 1980s and beyond presented in the report of the Task Force on Education for Economic Growth.[2] Figure 1 shows the task force's synthesis of skills needed, and we believe it is a solid first step in outlining competencies for the future. As you will note, the task force's list of recommended competencies is organized in nine major categories: reading, writing, speaking and listening, mathematics, science, reasoning, basic employment understandings, economic skills and computer literacy. This list is noticeably broader than the typical list of minimum competency skills required by nearly every state.

---

1 Basic Skills in the U. S. Work Force, Center for Public Resources, 1982.

2 Action for Excellence, Task Force on Education for Economic Growth, Denver, Colorado: Education Commission of the States, 1983.

Figure 1

BASIC SKILLS AND COMPETENCIES FOR PRODUCTIVE EMPLOYMENT

Reading Competencies

* • The ability to identify and comprehend the main and subordinate ideas in a written work and to summarize the ideas in one's own words.

* • The ability to recognize different purposes and methods of writing, to identify a writer's point of view and tone, and to interpret a writer's meaning inferentially as well as literally.

• The ability to vary one's reading speed and method and one's purpose for reading according to the type of material.

* • The ability to use the features of printed materials, such as a table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, bibliography.

* • The ability to define unfamiliar words by decoding using contextual clues or using a dictionary.

Writing Competencies

* • The ability to organize, select and relate ideas and to outline and develop them in coherent paragraphs.

* • The ability to write standard English sentences with correct:

sentence structure
verb forms
punctuation, capitalization, possessives, plural forms, and other matters of mechanics
word choice and spelling

* • The ability to improve one's own writing by restructuring, correcting errors and rewriting.

• The ability to gather information from primary and secondary sources, to write a report using this research; to quote, paraphrase and summarize accurately; and to cite sources properly.

Speaking and Listening Competencies

• The ability to engage critically and constructively in the exchange of ideas.

• The ability to answer and ask questions coherently and concisely, and to follow spoken instructions.

---

* Indicates skills covered in assessments conducted by the National Assessment of Educational Progress.

Figure 1 (continued)

Speaking and Listening Competencies

- The ability to identify and comprehend the main and subordinate ideas in discussions, and to report accurately what others have said.
- The ability to conceive and develop ideas about a topic for the purpose of speaking to a group; to choose and organize related ideas; to present them clearly in standard English.

Mathematical Competencies

* • The ability to perform the computations of addition, subtraction, multiplication and division using natural numbers, fractions, decimals and integers.

* • The ability to make and use measurements in both traditional and metric units.

* • The ability to use effectively the mathematics of:

integers, fractions and decimals
ratios, proportions and percentages
roots and powers
algebra
geometry

* • The ability to make estimates and approximations, and to judge the reasonableness of a result.

* • The ability to use elementary concepts of probability and statistics.

Scientific Competencies

* • The ability to understand the basic principles of mechanics, physics and chemistry.

* • The ability to distinguish problems whose genesis is in basic mechanics, physics or chemistry.

* • The ability to apply basic scientific/technical solutions to appropriate problems.

Figure 1 (continued)

Reasoning Competencies

* • The ability to identify and formulate problems, as well as the ability to propose and evaluate ways to solve them.

* • The ability to recognize and use inductive and deductive reasoning, and to recognize fallacies in reasoning.

* • The ability to draw reasonable conclusions from information found in various sources, whether written, spoken, tabular or graphic, and to defend one's conclusions rationally.

* • The ability to comprehend, develop and use concepts and generalizations.

• The ability to distinguish between fact and opinion.

In addition to the above competencies identified by the Center for Public Resources, the following competencies were also felt to be important:

Basic Employment

• The ability and willingness to assume the responsibility of a good citizen.

• The ability to engage in interpersonal relationships.

• The ability to cope with requirements concerning attendance and punctuality.

Economic Competencies

* • The ability to understand personal economics and its relatiionship to skills required for employment and promotability.

* • The ability to understand our basic economic system (e.g., profits, revenues, basic law of supply and demand, etc.).

Computer Literacy Competencies

• The ability to follow predefined procedures and to understand when the procedure is completed successfully and when it is not.

• The ability to operate equipment that requires the understanding of a predefined procedure, to know when operator action is required.

• The ability to recognize when a predefined procedure is in a special state and to identify the source of assistance.

• The ability to understand the basic functions of a computer device (terminal, CRT, etc.).

A major point the task force makes is that we must upgrade our definition of "basic" skills to include more of the skills that will be in demand in tomorrow's technologically sophisticated work place. In the future, minimal basic competency in reading, for example, will probably include not only the ability to decipher literally a simple paragraph but also the abilities to analyze, summarize and infer meanings from passages. Minimal mathematical competency will likely include not just the ability to compute with whole numbers, but also the ability to estimate, to judge the reasonableness of answers and to solve problems. It is also quite evident that the minimum competencies needed must go beyond reading, writing and mathematics, as the listing of other areas by the task force makes clear.

In summary, then, the types of "basic" skills we must teach are changing. But in many cases the schools have not caught up with the need for change. Speaking and listening skills, for example, are often neglected, perhaps because schools are more concerned with reading. Although there is general recognition that we should be teaching something called computer literacy, there is considerable confusion about what it is, how it should be taught and so forth. Such confusion exists in other areas as well.

It appears that the list of competencies prepared by the task force is an excellent beginning from which work can begin to define more specifically the skills that will be needed in the future. But assuming that this list is a fairly accurate representation of the skills that will be needed, how are we doing, today, in developing these skills in our students?

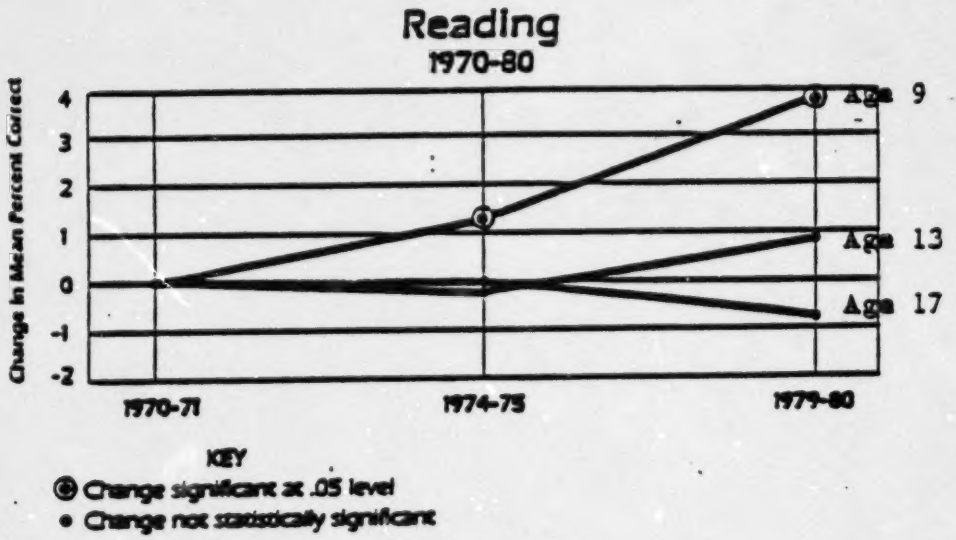
What is the Current State of Students' Skills?

No one has made a comprehensive study of ability levels with regard to all the competencies on the foregoing list and it's not sure how we would assess some of them. But we can turn to data from the National Assessment of Educational Progress (NAEP) to shed light on many of these areas.

In recent years, National Assessment's data collection efforts have been most heavily focused in reading, writing and mathematics because assessment of these areas is mandated under the legislation establishing NAEP. Data on science and consumer skills were collected during the mid-seventies, with an additional small-scale science assessment completed in 1982. Therefore, referring back to the list of competencies prepared by the task force, you will notice that National Assessment has at least some information specific to six of the nine competency areas. We do not have data available on speaking and listening skills or basic employment, except as the recent citizenship assessment touches upon some of the qualities of a good citizen. Data on reasoning competencies are embedded within the mathematics, science and reading results. Computer literacy has been surveyed to a limited extent in the mathematics assessment, although the specific competencies listed by the task force were not covered. The assessment tapped students' knowledge of what computers can and can't do and examined their ability to read a simple flow chart.

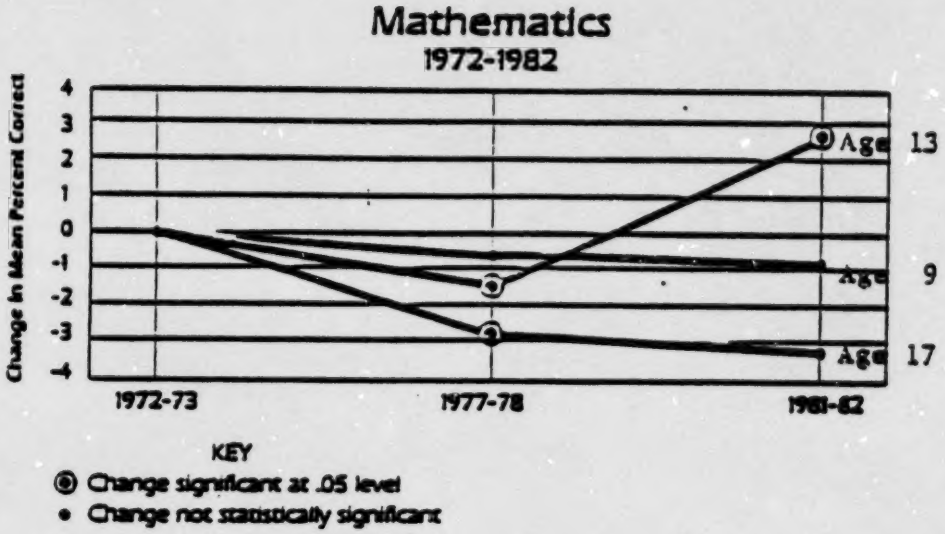
What do NAEP data tell us about ability levels on the competencies listed? Beginning with reading: as seen in Figure 2, 9-year-olds made sizable improvements over the course of the decade, improvements that were reflected in their performance on literal and inferential comprehension as well as study skills. Thirteen-year-olds held their own, posting slight improvements in literal comprehension. Seventeen-year-olds' overall performance did not change; however, alarming to many is the fact that they experienced a 2 percentage point decline in inferential comprehension, the ability to infer meanings not explicitly stated in a reading passage.

Figure 2.



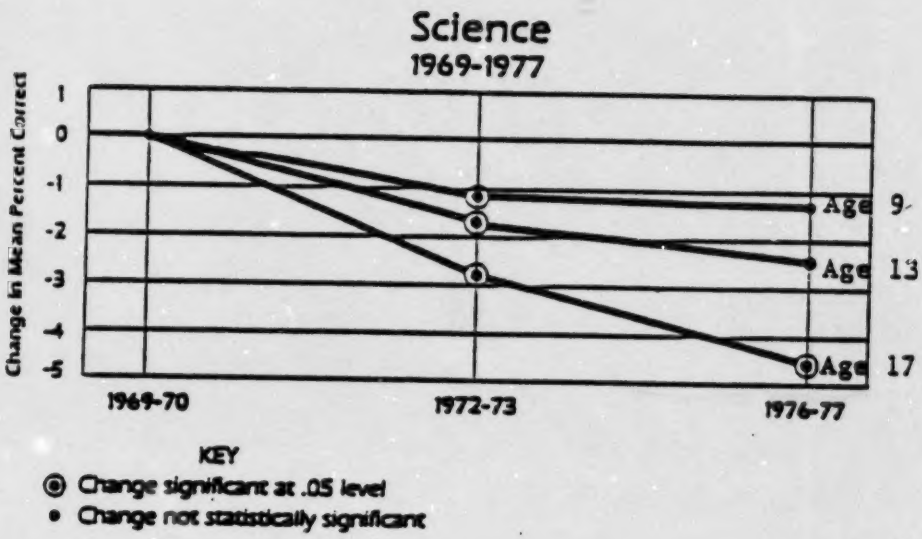
Turning now to the mathematics assessment, for which third round results were released just last spring, we see a significant gain among 13-year-olds over the last four years, more than offsetting their previous decline, and a leveling off of the earlier drop seen for 17-year-olds (Figure 3). Nine-year-olds' achievement has stayed basically the same across assessments. Here again, improvements among the 13-year-olds were largely concentrated on more basic skills such as whole number computation. Improvements were smaller on routine problem solving tasks and nonexistent on nonroutine problems, where students had to cope with extra information or problems requiring several steps.

Figure 3.



In science, the picture painted during the beginning of the 70s, when the data shown in Figure 4 were collected, was bleak in the extreme. Data from a recent small-scale science assessment, conducted in 1982 by Wayne Welch of the University of Minnesota in cooperation with National Assessment, indicate a slight upturn in science knowledge for 9-year-olds -- the first encouraging sign in science since NAEP has monitored it. Thirteen-year-olds' knowledge about science did not change appreciably between 1977 and 1982 -- marking a leveling off in their performance. For 17-year-olds, however, the news is not good. Their science achievement has gone down by 2 percentage points since the 1977 assessment, a continuation of the pattern of declines we see in Figure 4. Seventeen-year-olds' overall positive attitudes toward science also declined, although there was a slight upsurge of interest in science activities and science as a career.

Figure 4.



In the area of writing, overall skills did not change much during the 70s; however, 10 to 25 percent of the student population continued to have serious difficulties with the conventions of writing. On persuasive writing, a task typically viewed as demanding more complex skills than other types of writing, performance of both 13- and 17-year-olds declined.

Thirteen-year-olds responded to the item shown in Figure 5 to demonstrate their persuasive writing skills. Writing samples were scored as to whether the writing accomplished the purpose of the task assigned -- in this case, to persuade the principal to accept a proposed change. Marginally acceptable papers had to at least define a change and offer a minimal defense. To be scored competent or better, students had to define and defend their change, explain how to bring about the change and how it would benefit the school. Percentages composing a marginal or better paper dropped approximately 5 percentage points between assessments -- from 69 to 64 percent. The percentage of 13-year-olds writing competent or better persuasive papers fell from 28 to 20 percent.

Figure 5.

Persuasive Writing Item for 13-Year-Olds

13-year-olds responded to this item:

> Imagine that your principal asked for suggestions about how to make things better in your school. Write a letter to your principal telling just ONE thing you think should be changed, how to bring about the change, and how the school will be improved by it.

	1973	1978	Change
Marginal or better papers	69.1%	64.0%	-5.1
Competent or better papers	28.4%	20.3%	-8.1

Seventeen-year-olds responded to a similar task, writing a speech to either support or oppose the opening of a recreation center in a residential neighborhood (Figure 6). Percentages writing marginal or better essays fell from 78 to 72 percent; percentages composing competent or better papers dropped from 21 to 15 percent.

Figure 6.

Persuasive Writing Item for 17-Year-Olds

17-year-olds responded to this item:

> Some high school students have proposed converting an old house into a recreation center where young people might drop in evenings for talk and relaxation. Some local residents oppose the plan on the grounds that the center would depress property values in the neighborhood and attract undesirable types. A public hearing has been called. Write a brief speech that you would make supporting or opposing the plan. Remember to take only ONE point of view. Organize your arguments carefully and be as convincing as possible.

	1974	1979	Change
Marginal or better papers	78.0%	72.7%	-5.3
Competent or better papers	21.4%	15.2%	-6.2

In literature, 10 percent fewer 17-year-olds wrote adequate analyses to support their opinion about a literary work in 1980 than in 1971. Many students simply retold the story or poem when asked to discuss theme or main ideas of written passages. By age 17, most students could express initial evaluations about stories or poems, but few could go on to explain or support their opinions.

Figure 7.

Literature Item

Mother to Son

Well, son, I'll tell you:
Life for me ain't been no crystal stair.
It's had tacks in it,
And splinters,
And boards torn up,
And places with no carpet on the floor--
Bare.
But all the time I'se been a-climbin' on,
And reachin' landin's,
And turnin' corners,
And sometimes goin' in the dark
Where there ain't been no light.
So boy, don't you turn back,
Don't you set down on the steps,
'Cause you finds it's kinder hard.
Don't you fall now--
For I'se still goin', honey,
I'se still climbin'
And life for me ain't been no crystal stair.

--Langston Hughes

Did you think this was a good poem?

○ Yes

○ No

What was it about the poem that led you to choose the answer you did to the first question?

For example, 13- and 17-year-olds responded to the item shown in Figure 7. The majority of the teenagers felt this was a good poem. However, whatever their judgments, 47 percent of the 13-year-olds and 57 percent of the 17-year-olds simply offered a plot summary of the poem to support their evaluations. Many others offered vague generalizations that could have applied to any poem -- it was interesting, exciting, true and so forth. Only 4 percent of the 13-year-olds and 8 percent of the 17-year-olds gave at least one reason for their judgment supported by evidence other than a plot summary.

Turning to consumer competencies, many 17-year-olds do not appear to be well prepared to meet the demands of the world awaiting them as consumers. Most (86 percent) know that a lender can repossess a car and sell it to another buyer if the original buyer fails to keep up the payments. But only 32 percent are aware that if a repossessed car is sold for less than what is owed the lender, the original borrower is personally liable for the difference. Two-thirds of the 17-year-olds realize that using a credit card may involve interest charges; about half recognize that use of credit means the fixed expenses they must meet will increase.

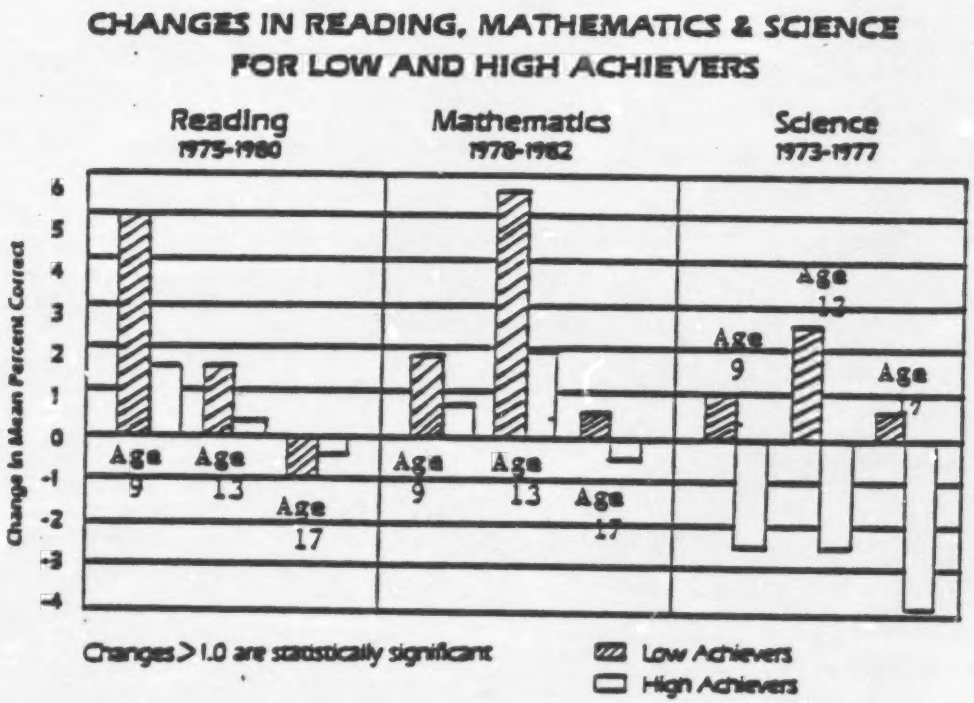
The majority of the 17-year-olds (78 percent) know that if a person takes money from a savings account to buy stock, the person is accepting risks in the hope of greater gain. However, a smaller percentage (56 percent) know that if one invests $1,000 in common stock, there is no guarantee of how much the stock will be worth in five years.

Results on a writing task also indicate a certain lack of preparedness. When asked to write a letter to straighten out a billing error, about one-third of the students failed to write adequate letters. Many left out specific information, such as dates or account numbers, or did not indicate the actions they felt should be taken.

Consumer mathematics skills also appear to be in need of attention. Less than three in ten 17-year-olds correctly estimated a 15 percent tip on a $28.75 dinner bill. Only 56 percent correctly figured average gas mileage for a car, whether or not they used a calculator.

One bright spot in National Assessment's results, however, is that lower achieving students are showing improvements. Unfortunately, a corresponding gain has not occurred for the high achievers. In a recent study of National Assessment mathematics, reading and science data, performance of high and low achievers was compared. As Figure 8 displays, in both mathematics and reading 9- and 13-year-old low achievers made considerably greater gains than their high achieving counterparts. For 17-year-olds, neither group made significant changes in these learning areas. In science, differences are even more marked, with high achievers at all three ages experiencing considerable losses.

Figure 8.



The overall National Assessment findings are not particularly encouraging, especially for 17-year-olds. But perhaps even more ominous is the fact that we are not making improvements or even holding our own in higher level reasoning and problem-solving skills, skills that are among those identified as critical for students' participation in the high tech economy of the future. As noted, performance on lower-order skills such as literal reading comprehension, whole number computation, writing mechanics or, in science, knowledge of biology terms generally improved or at least remained stable over the last decade. But higher-order skills, such as inferential reading comprehension, mathematics problem solving and persuasive writing showed dangerous signs of erosion, particularly for 17-year-olds.

Several other examples will perhaps further illustrate the need to redefine basic skills to take in the higher order thinking and problem solving skills that business and industry are telling us our students must acquire. An insurance company described the employee who paid a dental policy holder $2,200 for a claim of $100 instead of the $22.00 due and did not even recognize the error--a complete failure to reason through the situation. Companies questioned in the Council for Public Resources study describe the impact of reasoning deficiencies in terms of the increase in employee accidents because of the failure to anticipate the logical consequences of actions. Corporate executives also state that those who have developed a fundamental ability to reason through problems will adapt to job retraining more easily and thus ensure more stable employment futures for themselves.

As another example of students' lack of reasoning power, consider the problem seen in Figure 9, which was administered in the latest NAEP mathematics assessment. The students generally recognized that the problem requires division, but many did not know how to deal with their answer once they had divided. As you can see, using a calculator didn't help their performance any; in fact, quite the opposite. This is the central problem. There are machines that can do the calculations but it is still necessary to know what questions to ask and how to use the results.

How Do We Deal With the Mismatch?

Given the fact that current student skill levels are not in line with the skills that are needed for employment in the future, we need to re-evaluate our emphases and determine how we are going to promote a better match. For hints to these solutions, let's look for a moment at what happened during the 1970s -- at what was effective and what wasn't.

Figure 9.

Mathematics Item for 13-Year-Olds

An army bus holds 36 soldiers. If 1,128 soldiers are being bused to their training site, how many buses are needed?

Answer	Percentages of response in 1982 Without calculator	With calculator
32 (correct)	23.9%	7.1%
31.33, 31-1/3, etc.	28.9	16.2
31	17.5	25.3
Other	29.7	51.4

During the 1970s major public pressure was brought to bear on schools to improve basic, lower-level skills, especially among disadvantaged populations. Notice that NAEP results show that on those skills and for those groups improvements were found. Although we cannot say conclusively that public pressure caused the increases in lower-level skills, one might reasonably assume that some linkages were there.

One of the mathematics educators who served on the interpretive team for NAEP's latest mathematics assessment made the point that during the seventies we made a deliberate choice to emphasize certain skills and certain groups of students. The significant thing is that when we did make such a choice, such a commitment, we did have an impact, as is evident from the NAEP results. And in areas where we didn't concentrate, improvements were much less. Once we decide to act jointly and emphatically education can, indeed, make a difference.

And that is a part of the strategy suggested: that we first examine our needs and then act in concert to remedy the problems we face. We need to carefully review the lists of skills that we have before us, determine which are appropriate to our states or communities, and sort through those skills with business and industry leaders, parents and educators. After identifying the needed skills, we need to carry out a program of assessment so we can say with surety where strengths and weaknesses lie. Then we need to bring pressure to bear on the appropriate groups to bring these factors in line.

What are some actions that we as state education leaders can take? A springboard for thinking about policy directions and actions has been a paper by Rex Brown, ECS' publications director, who has worked with NAEP data for many years and authored numerous NAEP reports. In this paper, "National Assessment Findings and Educational Policy Questions,"[3] Brown has taken results from the past 10 years of NAEP's data collection and extracted a compendium of 67 significant findings (Figure 10).

After culling these significant findings from the wealth of NAEP data available, Brown drew from them a number of implications for education policy makers. Figure 11 presents many of his suggestions for state policy makers, with some modifications and additions that we have included based on the findings of the Task Force on Education for Economic Growth and other recent information. We would like to use these suggestions as a starting point for discussions of the policy implications arising out of the disparity between our current economic situation and student achievement levels. The suggestions focus on possible actions by governors, state legislators, state departments of education, state and district textbook selection committees and state postsecondary governing boards.

---

[3] Rexford Brown, "National Assessment Findings and Education Policy Questions," Denver, Colorado: Education Commission of the States, 1982.

Writing

Writing was assessed in the 1969-70, 1973-74 and 1978-79 school years. Except for background questions about attitudes, courses taken and so on, the writing assessments use no multiple-choice measures of writing. They are based entirely on essays, letters and other such tasks, which are scored qualitatively, using holistic and primary trait approaches, and are described quantitatively in terms of such things as mechanics, syntax and coherence.

The writing reports in which the following findings are detailed are: Writing Achievement, 1969-79: Results From the Third National Writing Assessment: Volume I, 17-Year-Olds (V1); Volume II, 13-Year-Olds (V2); and Volume III, 9-Year-Olds (V3). All are available through the Education Commission of the States's Distribution Center.

Findings

14. Between 1970 and 1979, the percentage of 9-year-olds' expressive essays rated 3 or 4 on a 4-point scale rose 6 percentage points. The percentage of quality narratives declined, while the percentage of good or excellent persuasive writing tasks stayed the same over the decade (V3, pp. 13, 16, 27, 32).

15. Between 1969 and 1978, there was a decline in the quality of 13-year-olds' descriptive essays, most of it taking place between 1969 and 1973. Thirteen-year-olds also showed declines in persuasive writing and in the coherence of their essays (V2, pp. 15, 16, 32).

16. Between 1969 and 1979, 17-year-olds' descriptive and explanatory writing performance did not change. However, their performance on persuasive writing tasks declined between 1974 and 1979 from 21% writing good papers to 15% (V1, pp. 12, 14, 20, 26, 31).

17. On most writing exercises, Black students either improved at a faster rate than all students or stayed at the same level while all students declined.

18. Error analysis of thousands of essays written in 1969-70, 1973-74 and 1978-79 reveals no real changes in the commission of such common errors as sentence fragments, run-on sentences, capitalization, punctuation, agreement or spelling. That is, students at all three ages continued to make about the same number of mistakes in their first draft writing, on average, throughout the decade (V1, pp. 42-46; V2, pp. 40-43; V3, pp. 40-43).

19. Analyses of the fluency and maturity of students' writing did not reveal any noteworthy changes over the decade (V1, pp. 40-42; V2, pp. 37-39; V3, pp. 37-40).

20. At all three ages, a sizable proportion of young people -- 10% to 25% -- display very serious problems with writing (V1, p. 52; V2, p. 48; V3, p. 48).

21. At all three ages, about 20% to 25% of the students are fearful about writing, have a sense of doom about it and avoid it whenever they can (V1, pp. 142-143; V2, pp. 124-125; V3, pp. 44-45).

22. One-third of the 17-year-olds are doing some writing across all their courses -- at least one paper a week (V1, pp. 48-49).

23. Two-thirds of the 17-year-olds are not doing any appreciable writing in their classes (V1, pp. 48-49).

24. Eighty percent of the 17-year-olds spend a third or less of their English class time studying writing (V1, p. 48).

25. Sixty percent of the 17-year-olds get neither written suggestions back from the teacher on their papers nor discussions with the teacher about their work (V1, p. 49).

26. Only 7% of the 17-year-olds appear to be receiving comprehensive writing training, i.e., training in prewriting, practice in improving papers and experience in getting good feedback from their teachers (V1, p. 49).

Literature

There have been two national literature assessments, the first in 1970-71 and the second in 1979-80, when literature was combined with reading. Much of the literature assessment involved asking students to respond in writing to various kinds of literature. The findings below are all discussed in detail in Reading, Thinking and Writing (RTW). Findings 27-29 are also discussed in Reading Comprehension of American Youth (RCA). Both are available through the Education Commission of the States's Distribution Center.

Findings

27. When reading on their own, three-quarters of the teenagers say they read for less than one hour (RTW, p. 7; RCA, p. 5).

28. Most teenagers (two-thirds or more) do no homework or less than one hour per night (RTW, p. 8; RCA, p. 6).

29. More than 60% of the teenagers say they watch television for more than one hour per night: half the 13-year-olds watch three hours or more, as do one-third of the 17-year-olds (RTW, p. 8; RCA, p. 4).

30. More than a quarter of the teenagers say it is usually hard for them to finish a book they have started (RTW, p. 9).

31. One-third of the teenagers say it is hard keeping their minds on reading (RTW, p. 9).

32. Forty to fifty percent of the teenagers say it is hard for them to read materials with "new words" (RTW, p. 9).

33. One-third of the teenagers have problems finishing classroom silent reading (RTW, p. 9).

34. One-third of the teenagers say they have trouble finishing "long books" (RTW, p. 9).

35. When asked to respond to literary works and explain their response in writing by analyzing the work, very few teenagers demonstrated strong analytic skills. In fact, only 5% to 10% of them did so. Another 35% to 50% showed they had an inkling of what to do; 25% to 40% tended to "retell" the work (summarize the plot or main idea); and 10% to 15% proved unable to do it at all (RTW, pp. 15-24).

36. The percentage of 17-year-olds writing adequate analyses to substantiate their opinions about the mood of a literary work declined 10 percentage points between 1971 and 1980 (RTW, p. 23).

37. When asked to discuss theme and main idea of literary passages, students tended most frequently to retell the story or poem (RTW, pp. 33-46).

38. Students' written responses to literary works are heavily influenced by the work. If the characters and situations are close to the students' experiences, they respond with a personal analysis, for instance. However, their personal responses were usually undeveloped, unsupported and rather notional (e.g., "he shouldn't have said that to his father," etc.). And, over the seventies, the students became even more notional and judgmental (RTW, pp. 25-46).

39. Thirteen-year-olds tended to move away from retelling responses and more toward superficial evaluations and unsupported judgments (RTW, pp. 33-46).

40. Over the decade, fewer 17-year-olds wrote responses based upon inferential leaps (right or wrong) and more wrote "egocentric" responses (in which they talk mainly about themselves instead of the work) and superficial evaluations (RTW, pp. 33-46).

Mathematics

The first three mathematics assessments were in 1972-73, 1977-78 and 1981-82. The mathematics assessments involved a broad range of exercises assessing all aspects of the elementary and secondary mathematics curriculum except higher algebra, trigonometry or calculus.

The results mentioned below come from the following reports: The Third National Mathematics Assessment: Results, Trends and Issues (TMA); Changes in Mathematical Achievement, 1973-78 (CMA); Mathematical Knowledge and Skill (MKS); Mathematical Application (MA); Mathematical Understanding (MU); Reading, Science and Mathematics Trends: A Closer Look (RSM); Mathematics Technical Report: Summary Volume (MTR); and Results From the Second Mathematics Assessment of the National Assessment of Educational Progress, published by the National Council of Teachers of Mathematics (NCTM). All but the last report are available through the Education Commission of the States's Distribution Center.

Findings

41. Nine-year-olds' overall performance was stable between 1973 and 1982, neither improving nor declining significantly (TMA, p. xiii).

42. Thirteen-year-olds' performance declined 2 percentage points between the first two assessments and then improved more than 4 points between the second and third (TMA, p. xiii).

43. Seventeen-year-olds' performance declined about 4 percentage points between the first and second assessments and then stayed at about the same level between the second and third (TMA, p. xiii).

44. At all three ages, performance on knowledge exercises stayed about the same between 1973 and 1978, but performance on problem-solving exercises declined dramatically: 5.9 percentage points at age 9; 3.4 points at 13; and 4.0 points at age 17. In skills, 13-year-olds declined 2.0 percentage points and 17-year-olds declined 5.0 points (CMA, pp. 12-16; MA, pp. 1-25).

45. Between the second and third assessments, 9- and 17-year-olds had no significant average gains or losses on those exercises

specifically assessing mathematical knowledge, skills, understanding or application. Thirteen-year-olds improved significantly in all four areas; however, they improved most on the knowledge, skills and understanding exercises and least on the application exercises (TMA, p. xv).

46. In spite of declines, most students at all three ages demonstrated a high level of mastery of computational skills, especially those involving whole numbers. However, majorities at all three ages demonstrated weaknesses in such areas as geometry, measurement and probability (MA, pp. 13-20).

47. While other groups of 9- and 13-year-old students were showing declines in performance, Black young people were not. Black 9-year-olds' overall performance improved 3 points and black 13-year-olds' overall performance remained stable between 1973 and 1978 (CMA, pp. 18-22). Furthermore, 13-year-old Black and Hispanic students made substantial gains (about 7 percentage points) between 1978 and 1982. In general, the most significant gains were on exercises assessing the lower cognitive levels of knowledge and skills (TMA, p. 3).

48. Between the first two assessments, students in the highest achievement class declined 3 to 4.3 points, while the lowest achievers did not decline at all (RSM, p. 5). Between 1978 and 1982, both high and low achievers' performance changed at about the same rate at ages 9 and 17. At age 13, however, low achievers gained almost 6 points while high achievers gained about 2 points (TMA, pp. xviii, xix).

49. Over 85% of the 17-year-olds in the assessment said they had access to a calculator. Results indicate that half the students are reasonably proficient in division as they near high school graduation. However, over 50% of the 9-year-olds and 90% of the 17-year-olds could do long division correctly with a calculator (MTR, pp. 120-135).

50. Students in schools with heavy minority enrollment tended to perform below the national level, but these students improved their performance 8 percentage points between 1978 and 1982 (TMA, p. 3).

51. Between 1978 and 1982, the number of 17-year-olds reporting access to computers for learning mathematics increased from 24% to 49%. The proportions of students reporting that they knew how to program a computer also rose -- from 8% to 20% at age 13 and from 12% to 22% at age 17.

52. Between 1978 and 1982, students' familiarity with the metric system increased dramatically. At all ages, students performed better on items testing knowledge of metric units

and worse on items testing knowledge of the English system (TMA, p. 4).

53. Teenagers rated mathematics as the most important of their school subjects (NCTM, p. 133).

54. Nine-year-olds rated mathematics as the best liked of five academic subjects; 13-year-olds rated it as the second best liked subject; and 17-year-olds rated it as the least liked subject (NCTM, p. 134).

55. Thirteen-year-olds said mathematics was the easiest of their academic subjects, but 17-year-olds rated it as the hardest (NCTM, p. 139, 140).

56. Over half the students at all three ages thought they were good at mathematics and said they enjoyed the subject (NCTM, p. 139, 140).

57. A large majority of students at all ages felt that a knowledge of mathematics was important in order to get a "good" job (NCTM, p. 141).

58. Students perceive their role in the mathematics classroom to be primarily passive. They feel they are supposed to sit and listen and watch the teacher work problems, then spend their remaining time working out problems alone. They have little opportunity to interact with their classmates or undertake exploratory projects (NCTM, p. 136).

Science

Science was assessed in the 1969-70, 1972-73, 1976-77 and 1981-82 school years. Changes in science achievement are based upon the responses of 17,000 to 29,000 respondents of each age to 70 to 92 exercises covering both the physical and biological sciences. The science findings are detailed in Three National Assessments of Science: Changes in Achievement, 1969-77 (TNA); Images of Science (IOS); Reading, Science and Mathematics Trends: A Closer Look (RSM); and Attitudes Toward Science (ATS). All are available through the Education Commission of the States's Distribution Center.

59. Nine-year-olds declined on physical sciences exercises from 1969-77. However, they improved their performance on biology exercises between 1973 and 1977 (TNA, pp. 6-9). In addition, 9-year-olds showed a 1 percentage point gain in science achievement between 1977 and 1982 (IOS).

60. Thirteen-year-olds followed the same pattern as 9-year-olds: a decline in physical sciences and an improvement, between

1972 and 1976, in biology (TNA, pp. 6-10). Their performance did not change between 1976 and 1981.

61. Seventeen-year-olds declined 2.8 points between the first two assessments, 1.9 points between the next two and 2.0 points between 1977 and 1982 (IOS).

62. Declines in science were greatest among the highest achievers, especially White high achievers at ages 9 and 13 (RSM, p. 5).

63. Teenagers list science as only their fourth favorite course, behind mathematics, English and social studies (ATS, p. 5). In addition, there was a large decrease (7 points) in positive attitudes toward science between 1977 and 1982 (IOS).

64. Forty-four percent of the 13-year-olds and 37% of the 17-year-olds say they always or often like their science classes (ATS, p. 6).

65. Eighty-one percent of the 17-year-olds said their science teacher "really likes science"; 48% said the teacher makes science exciting (ATS, p. 8).

66. About half the teenagers say they are interested in scientific careers (ATS, p. 12).

67. About a quarter of the teenagers think a scientific education for a career would cost too much (ATS, p. 15).

Figure 11

POSSIBLE POLICY AND ACTION IMPLICATIONS

Some suggested actions based on NAEP findings are given below for governors, state legislators, state departments of education, state and district textbook selection committees and state postsecondary governing boards.*

GOVERNORS

1. Call attention to both the good and bad news in findings in student achievement through state-of-the-state addresses.
2. Establish commissions to determine the extent to which these national trends match state trends, to recommend coordinated approaches to the higher-level skill problems and to redefine the state's educational goals and commitments.
3. Encourage private sector support for innovative educational programs through speeches, state blue ribbon commissions and proposed legislation.

STATE LEGISLATORS

1. View education expenditures as critical investments in the human capital that will attract business and industry to the state and ensure a viable state economy.
2. Create incentives for a stronger postsecondary/secondary school partnership.
3. Provide incentives for good teachers to stay in the schools.
4. Work with state departments of education to establish appropriate testing systems to monitor student progress.
5. Work with state departments of education to determine ways to promote appropriate role of technology in teaching.
6. Work with state departments to build school changes in sound principles of effective schools.

STATE DEPARTMENTS OF EDUCATION

1. Review tests and assessments to establish the extent to which the state's trends mirror the national trends.

* The suggested actions draw heavily from Brown, R. "National Assessment Findings and Educational Policy Questions". Denver: Education Commission of the States, 1982.

2. Review content of state tests and assessments to determine if they are emphasizing desired skills.

3. When establishing curricular guidelines, pay particular attention to:

   a. The acquisition of inferential comprehension and a commitment to reading.

   b. The use of writing in any subject area as a way of promoting analytical, interpretive and evaluative skills.

   c. Methods of stimulating more student writing of many different kinds and discouraging overattention to sentence-level instruction.

   d. Students' boredom with "dumbed down" books, their fear of writing, anxiety about mathematics and resistance to senior high school science programs.

   e. The need to go beyond retelling in response to written material.

   f. Word problems and problem-solving skills.

   g. The integration of the calculator and computer into the mathematics curriculum.

   h. Scientific literacy for all students.

   i. Exercises, assignments, activities that challenge even the best students.

4. Provide technical assistance to schools and districts, with particular attention to inservice training in the development of problem-solving teaching strategies.

5. Assist textbook selection committees by providing achievement and research information and guidelines for evaluating the degree to which books offer sufficient interest and challenge to all students.

6. Develop assessment and record-keeping systems to monitor statewide progress on <u>both</u> low-level and higher-level competencies.

7. Institute reviews, through teacher licensing and certification boards, of the course work required of teachers. To the extent current requirements do not involve sufficient training in teaching higher-level skills or adequate content course coverage, revise the requirements.

STATE OR DISTRICT TEXTBOOK SELECTION COMMITTEES

1. Solicit reviews of current textbooks to determine the degree to which their language, questions and associated workbooks are underchallenging students.
2. Develop specifications for textbooks that:
   a. Promote analysis, synthesis, interpretation and evaluation.
   b. Contain content interesting to the full range of students who will be using them.
   c. Encourage writing, experimentation and discussion.
   d. Do not fragment subjects so much students cannot see the forest for the trees.
3. Give as much attention to substantive research issues as to the sociopolitical issues surrounding textbooks.

STATE POSTSECONDARY GOVERNING BOARDS

1. Institute reviews of postsecondary programs and courses to determine the extent to which they only continue to promote a "basics" approach to learning.
2. Encourage courses for teachers that equip them to deal with the full range of student needs and abilities, that emphasize content knowledge and that convey the fruits of teacher effectiveness research.
3. Work with postsecondary institutions to more effectively use admissions requirements as a means of increasing student enrollment in mathematics, science and other college preparatory courses.
4. Join with state boards of education to promote greater cooperation between postsecondary institutions and public and private schools in reshaping education to address new needs.

These activities cannot, of course, be taken in isolation apart from others, but I think each is worthy of careful consideration. In a general sense these policy recommendations are intended to draw attention to the problem--the need for a better match of skills critical for economic growth with what is currently being taught and being measured.

The recommendations call for state governors to publicize student achievement levels, to establish commissions to study state achievement trends and educational goals and to encourage private sector support for education. State legislators should work closely with state departments of education to establish appropriate testing systems, to look carefully at curriculum guidelines, to build on sound principles of education growing out of research such as school effectiveness studies and to consider the appropriate role of technology. These recommendations also emphasize the need for state departments of education and textbook selection committees to take a careful look at curriculum content. Materials must offer interest and challenge appropriate to all students and must lead beyond the development of rote, lower level skills. Postsecondary governing boards should encourage postsecondary institutions to work closely with the rest of the education community in making sure that teachers are being adequately trained and equipped to meet the new demands being placed on the education system.

In closing, let me summarize by saying again that we need to carefully rethink what we mean by "basic" skills. We must be sure that we are preparing students with appropriate skills for the wide variety of positions they will face in our high tech economy. We need to ensure that we monitor both the higher and lower level skills that are essential, collectively, in our businesses and industries. And finally, we must look at education from a policy perspective and determine how we can best implement policies that allow educators, policy makers and the community at large to work effectively together to move us into a position to meet our economic challenges.